



How was Devils Tower formed -sedimentary rocks

Standards

National Science Education Standards Grades K-4

- Earth and Space

Changes in the Earth and Sky

The surface of the Earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions and earthquakes.

- Science as Inquiry

Understanding about scientific inquiry

Plans and conducts simple investigations.

- Science and Technology

Understanding about science and technology

People have always had questions about their world. Science is one way of answering questions and explaining the natural world.

Overview

Devils Tower is part of the Black Hills, which are dome mountains.

Dome mountains are formed when the rocks of Earth's crust are pushed upward.

This usually happens when some molten rock known as magma finds a way to get into rock layers below the mountain.

The layers of sedimentary rock above the uplifted dome are eroded away. In this activity students use clay to model the formation of a dome mountain. This demonstration also allows them to see the age of the sediment layers as they become exposed.

Watch the Power Point explaining Devils Tower Geology, "Geology of Devils Tower National Monument – Sedimentation"

Materials

- 2 each of four colors of clay or dough to represent the layers of sedimentary rock. (See recipe for dough below if needed.)

Recipe for soft dough

- 2 cups flour
- 1 cup salt
- 1 Tablespoons alum
- 2 cups boiling water
- 2 tablespoons baby oil
- Food coloring
- Mix dry ingredients. Add water and oil. Mix well. Color as desired. Stores a long time in baggies
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- Groups of students will need **2 sets** of about a fourth of a cup (1/3 stick) of each color.
- Plastic knife for each group.
- Bundle of "columns" (short pencils glued together)

Procedure

Working in small groups of 2 or three;

1. Flatten out each color to a similar size.
2. Stack the layers of clay sandwich style.
3. Discuss the age of the layers (i.e., the oldest at the bottom with the youngest on top).
4. Make a slight dome with the layers so that they don't stick to the table.
5. Push the bundle of "igneous columns" up under the center of the bulge, being careful not to let the columns poke through the top.
6. Using their hands, have students push toward the center from all sides. The clay should dome upward.
7. Using the plastic knife cut the top inch from the dome to reveal the layers. The oldest clay should show in the center around the bundle of igneous columns.

Results

- Deposits of mud, silt, or sand form horizontal layers of sedimentary rocks like the layers of clay before you pushed them together.
- The oldest layers are on the bottom, with the youngest layers on top, according to the Law of Superposition.
- Pressures within the Earth push the rock layers together for millions of years until they become domes.
- Erosion caused by wind, water, ice, and plants cause change in the layers by removing the top layers of softer rocks.
- Old mountains like the Black Hills show the effects of dome building (Bear Butte near Sturgis, S.D.); that is, you find the oldest rocks in the top center and the youngest rocks along the edges. This was represented when you removed the top from your dome to reveal the layers.

Discussion Questions

1. What did the layers of clay represent?
 2. What force was represented by your hands?
 3. How is erosion involved?
 4. What type of rock did the pencils in the middle represent?
 5. How are domed mountains different from volcanoes?
- Explain how this activity represents how sedimentary rocks are formed.

Optional Fieldtrip with Field Trip Activity – “Study Devils Tower Geology – Sedimentation”

Assessment:

Sedimentary Jeopardy Game

Note for teachers

1. **This lesson plan is designed for around the 4th – 6th grade. It can be modified for other grade levels.**
2. Let the students do the clay or silly putty activity
3. Show and explain the Powerpoint, - “Geology of Devils Tower National Monument – Sedimentation”
4. Play the Sedimentary Rock Jeopardy game. Turn off the sound first